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CASE REPORT

Development of a primary melanoma in situ within a full-thickness skin graft overlying a free muscle flap: a case report

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ABSTRACT

The development of a primary melanoma within the confines of free tissue transfer is a rare occurrence. In this report, we describe the development of a primary melanoma in situ within a full-thickness skin graft overlying a free latissimus dorsi muscle flap used to cover a scalp defect.

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KEYWORDS
Melanoma; free tissue transfer; skin graft; reconstruction

Introduction

Melanoma, although comparatively less common than other forms of skin cancer, accounts for the majority of skin cancer related deaths, comprising nearly 2% of total cancer deaths in the US [1]. Risk factors for the development of melanoma include advanced age, male gender, fair skin, light hair, freckles, UV exposure, and number of naevi [2]. Proper diagnosis and management are of paramount importance given the associated morbidity and mortality [1].

The standard of care for cutaneous melanoma involves surgical resection with adequate excision margins, with or without lymph node biopsy [3]. Nonmelanoma skin cancers, including basal cell and squamous cell carcinomas often require surgical excision as well [3]. Over 20 percent of new melanomas occur in the head or neck and often involve cosmetically sensitive areas [3]. There are many reconstructive options for closure of the resultant defects, including skin grafts, local tissue rearrangement, pedicled flaps, and free flaps [4]. Through the advent and advancement of microsurgery, free tissue transfer techniques have become increasingly common for the closure of large defects.

The risk of cutaneous malignancy during free tissue transfer is quite low, although the incidence is not known. There have been infrequent case reports of development of melanoma within transferred tissues. We present the case of a 76-year-old Caucasian man who underwent a free latissimus dorsi flap and skin graft for coverage of a scalp defect resulting from squamous cell carcinoma, and developed a primary melanoma in situ within the free tissue transfer.

Case report

A 76-year-old Caucasian man was referred to our institution for evaluation of a large open scalp wound, secondary to excision and prior radiation of squamous cell carcinoma (SCC) of the left temporal scalp (Figure 1). Prior to this he had history of multiple skin lesions including actinic keratosis and basal cell carcinoma located on the chest, back, head, and upper extremities. There was no previous history of melanoma. He was diagnosed with SCC approximately 10 years prior to evaluation by our team. Treatment with Mohs micrographic surgery and a course of radiation therapy were administered at that time. He then developed a local recurrence and a metastasis to the parotid gland approximately 5 years later. This was treated by parotidectomy with facial nerve dissection, excision of the temporoparietal lesion, and radiation therapy.

His current wound failed to heal since that time. The defect in the temporoparietal region was

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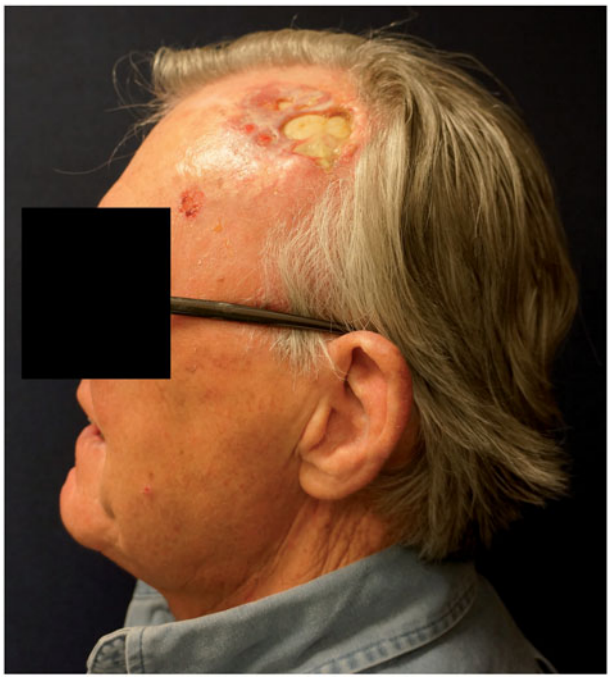

Figure 1. Patient presentation with large open wound.

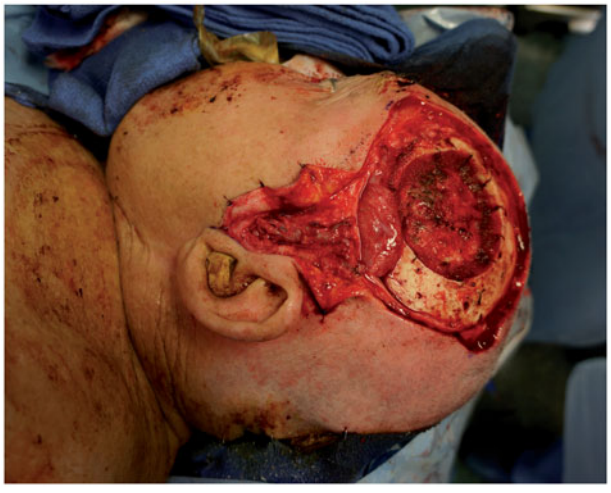

Figure 2. Surgical excision and craniectomy.

full-thickness, with exposed calvarium, without the presence of periosteum. He underwent surgical excision of the defect, including craniectomy, due to apparent involvement of the dura (Figure 2). A left latissimus dorsi myocutaneous flap was harvested for coverage of the defect (Figure 3). Due to flap inset considerations the skin island was removed from the latissimus muscle and was de-fatted. The muscle flap was inset and the full-thickness skin graft, taken from the original donor site, was chosen to cover the free flap (Figure 4). He followed up in our clinic 1 week after discharge, and again at 3 weeks, through which time he remained on IV antibiotics. There were no complications and he recovered well.

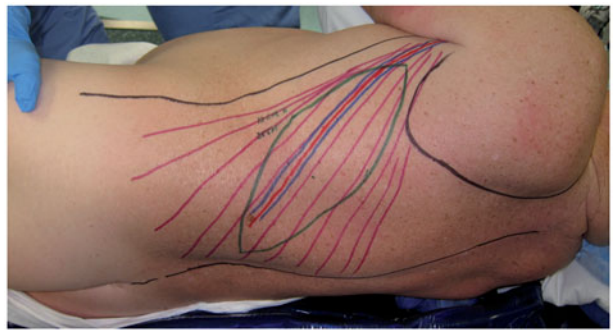

Figure 3. Patient marked for harvest of left latissimus dorsi flap.

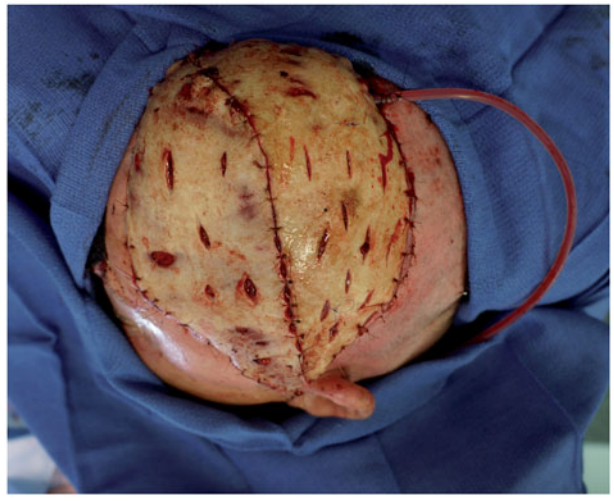

Figure 4. Flap inset and coverage by full-thickness skin graft.

Approximately six months later, he underwent cranioplasty for reconstruction of his calvarial defect. The patient recovered well, and had no initial complications. At this time he was scheduled for full skin cheques every 3 months at the dermatology clinic due to his other dermatologic issues related to actinic keratosis, basal cell carcinoma, and surveillance for recurrence of SCC. Approximately 19 months following his free flap reconstruction, a pigmented lesion located centrally within the skin graft overlying the flap was discovered (Figure 5). A biopsy was taken which showed atypical melanocytic proliferation and the lesion was excised with wide margins. The defect was closed primarily without any complications. The pathology report from the excision showed a melanoma in situ. As this was in the centre of the flap and skin graft, it necessarily arose in the transferred tissue.

Discussion

This case describes the occurrence of a primary melanoma in situ developing within the overlying skin graft

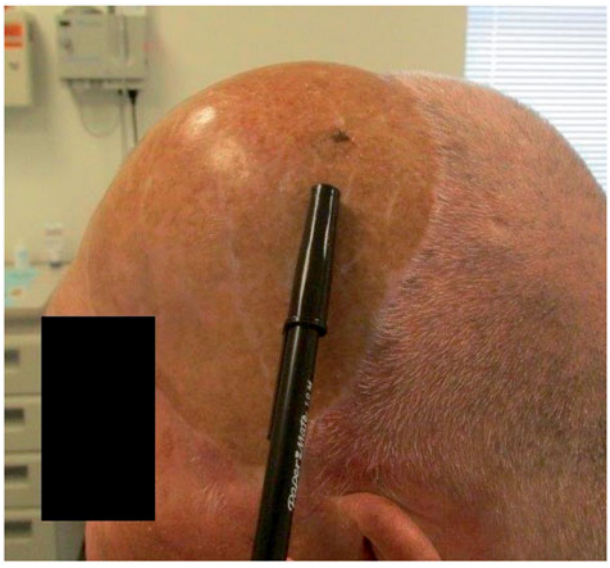

Figure 5. Pigmented lesion within central area of skin graft overlying the latissimus flap.

of a free latissimus muscle flap to cover a scalp defect. The occurrence of primary melanoma at the recipient site of a skin graft or free flap is a rare event with few previously reported cases [5–9].

The earliest report in 1954, described the concurrent development of melanoma within the graft and donor sites of a skin graft [5]. This case suggests that a portion of cells with pre-malignant potential were transferred from the donor to recipient site. The melanoma developed approximately 18 months after the graft was placed, suggesting a rapid progression to melanoma.

Another report involved a 48-year-old male who presented with a basal cell carcinoma of the lip [6]. A wide excision of the tumour was performed and a split-thickness skin graft was taken from his right arm. Ten years later, the patient presented with a primary melanoma at both the donor site as well as the recipient site. The authors report the presence of a Hutchinson's Freckle (lentigo maligna) at the donor site prior to harvest.

A third reported case describes the development of a primary melanoma within a skin graft donor site, in a patient who had extensive lymphatic malformations involving the left lower limb and abdomen [7]. The authors described the time to malignant transformation as rapid, but do not report the specific timeline of development.

The fourth case involved a woman diagnosed with malignant melanoma of the right leg which was excised and a split thickness skin graft taken from the contralateral thigh was used for reconstruction [8]. Approximately four years later the patient developed a malignant melanoma within the recipient site. Although there is some question of local recurrence, the authors proposed that this was a new primary melanoma due to the extremely superficial involvement of the second tumour, coupled with the deep local excision performed prior.

Another case describes a man who suffered from compartment syndrome due to a right tibial plateau fracture requiring a 4-compartment fasciotomy with subsequent split-thickness skin grafting [9]. The skin graft was harvested from the ipsilateral thigh. A year and a half after this operation, he presented for dermatologic evaluation of pigmented lesions at both the recipient and donor sites. These lesions were then diagnosed as invasive superficial spreading melanoma.

Our case is unique in that this patient's melanoma in situ developed in the middle of a full-thickness skin graft placed over a free muscle flap. This is different from a cutaneous malignancy arising in the donor or recipient site of a split-thickness skin graft.

It is now generally accepted that chronic inflammation can lead to tumour progression. The precise mechanism by which this occurs is unknown, but it may involve an initiation state involving somatic changes to the cell followed by a state of promotion, which is triggered by a different stimulus, such as inflammation, and causes cells to proliferate [10]. Over time, this process can result in tumour progression. Due to evidence for this long-term effect of inflammation, there has been interest in examining the inflammatory microenvironment in the setting of wound healing. During the inflammatory and proliferative phases cytokines, chemokines, growth factors, and transcription factors are released leading to an increase in cell proliferation necessary for the wound to heal. Several of these factors, including TGF-β, TNF-α, and PGE-2, have been shown to lead to a proliferation of tumour cells [11–17].

Related to this issue of the immune system aiding tumour progression, a disruption of lymphatics is also thought to aid in tumour growth through disturbing the process of immunosurveillance. Normally a circulating pool of lymphocytes migrates randomly through the vasculature and lymphatic system. When these lymphocytes encounter a transformed cell, they migrate through lymphatic channels and mount a t-cell mediated immune response [18]. The disruption of lymphatics within a free flap, or skin graft, may limit the tissue access to these circulating lymphocytes, hence preventing an appropriately mediated immune response. Furthermore, the milieu of inflammatory cytokines, present in a healing wound, may hinder appropriate cell signalling pathways, delaying or inhibiting proper function of lymphocytic surveillance [19].

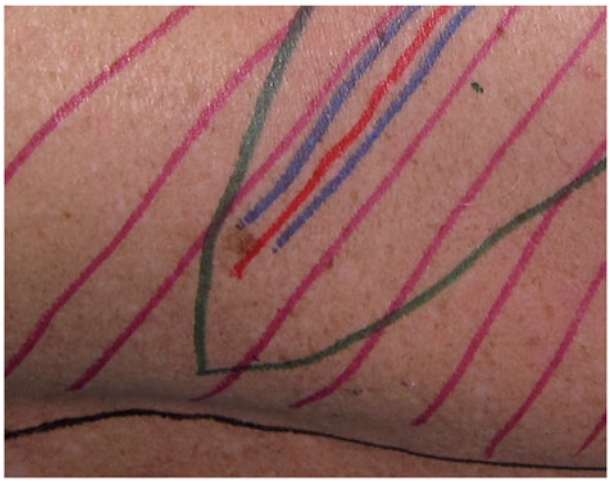

Figure 6. Pigment lesion located inferiorly may have been responsible for malignant transformation.

This case demonstrates the development of a melanoma in situ in the centre of a full-thickness skin graft covering a free latissimus muscle flap. The precise biological mechanism of development is unknown, but the upregulation of cytokines and growth factors may have contributed to the development and progression of this tumour. Additionally, it is unknown if this would have developed in situ (i.e. if the skin would not have been transferred as a full thickness graft). While there were no apparently alarming lesions located within the skin island at time of harvest, examining the preoperative photos raises questions whether the dysplastic or neoplastic cells were present prior to transfer (Figure 6). At this time, it is unknown whether surgery itself can be considered a risk factor for neoplastic transformation. However, it is important for reconstructive surgeons to be aware of this possibility and consider this accordingly as they choose their reconstructive donor site.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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